

## HIGH RESOLUTION SPECTRUM OF THE $^{13}\text{C}^{12}\text{C}^{12}\text{C}$ LOWEST BENDING MODE

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Linear  $\text{C}_3$  is a floppy molecule which possesses an extremely low lying bending mode,  $\nu_2$ , at roughly  $60\text{ cm}^{-1}$  or 1.9 THz. Based on highly accurate laboratory data<sup>a,b,c</sup>  $\text{C}_3$  has been detected in various astronomical sources<sup>d,e</sup> most recently with the HIFI instrument aboard the Herschel satellite<sup>f</sup>. Although  $\text{C}_3$  turns out to be quite abundant in interstellar environments which makes a search for  $^{13}\text{C}$  substituted isotopologs feasible, other isotopologs could not be detected so far, because no accurate transition frequencies have been available for these species in this frequency range. Relative abundance ratios of  $\text{C}_3$  isotopologs might give important hints on its building mechanism and further constraints for chemical networks.

In this work, the spectrum of the  $\nu_2$  lowest bending mode of  $^{13}\text{C}\text{CC}$  has been investigated. We used laser ablation of  $^{13}\text{C}$  enriched carbon samples to record absorption spectra in a supersonic jet expansion. The radiation in our setup is generated by a synthesizer referenced to a Rubidium standard in combination with a frequency multiplier chain and detected by a liquid Helium cooled InSb bolometer. The laboratory search has been supported by high-level coupled-cluster calculations, which turns out to compare very favorably with obtained experimental molecular parameters.

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<sup>a</sup>Schmuttenmaer, C. A., Cohen, R. C., Pugliano, N., Heath, *et al.*, *Science* **249**, 897–900 (1990)

<sup>b</sup>Giesen, T. F., van Orden, A. O., Cruzan, J. D., and Provencal, R. A., *et al.*, *Astrophys. J.* **551**, L181–L184 (2001)

<sup>c</sup>Gendriesch, R. and Pehl, K. and Giesen, T. and Winnewisser, G. and Lewen, F., *Z. Naturforsch.* **58a**, 129–138 (2003)

<sup>d</sup>Van Orden, A., Cruzan, J. D., Provencal, R. A., *et al.* in *Proc. Airborne Astronomy Symp., ASP Conf. Ser.* **73**, 67 (1995)

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<sup>f</sup>Mookerjee, B., Giesen, T., Stutzki, J., Cernicharo, J., *et al.*, *Astron. Astrophys.* **521**, L13 (2010)